

**TID Test Report
SMSA2815S (Interpoint) DC-to-DC Converter**

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I. Introduction

This report describes the testing and characterization of the SMSA2815S DC-to-DC converter manufactured by Interpoint for the Lunar Reconnaissance Orbiter (LRO) project. Testing commenced on 15th September, 2007 and ended on 1st November, 2007.

II. Part Information

Fig. 1 is a photograph of one of the SMSA2815S DC-to-DC converters. Table I contains information about the device and test conditions. Fig. 2 shows the pinout connections.

Table I.
SMSA2815S Device and Test Information.

Generic Part Number:	SMSA2815S
Full Part Number	SMSA2815S/HO, SMSA2815S/OO
Manufacturer:	Analog Devices
Lot Date Code (LDC):	0615 (2 parts SMSA2815S/OO) 0651 (1 part SMSA2815S/OO) 0651 (1 part SMSA2815/HO from LRO flight lot)
Quantity Tested:	4
Total number of parts supplied	4
S/N of Control Samples:	1444
Serial Number of Radiation Samples:	1559, 1445, 1561 (part from flight lot)
Part Function:	DC-DC converter, 15V single output, 16 to 40V input
Part Technology:	Hybrid
Package Style:	DIP14
Test Equipment:	TBD
Test Engineer:	Jim Forney
Dose Levels (krad (Si))	2,5,7,10,15,30,50
Target dose rate (rad (Si)/min)	1.2



Fig. 1. Photograph of one of the SMSA2815 DC-to-DC Converters used as the control.

PIN OUT		
Pin	Single Output	Dual Output
1	Positive Output	Positive Output
2	Output Common	Output Common
3	No connection	Negative Output
4	No connection	No connection
5	Inhibit	Inhibit
6	Positive Input	Positive Input
7	Input Common	Input Common
8	Case Ground	Case Ground

Squared corner on header and dot on top of cover indicate pin one.

BOTTOM VIEW
SMSA

See Figures 23 and 24 for dimensions.

FIGURE 5: PIN OUT BOTTOM VIEW

Fig. 2. Pin-out of the SMSA2815 DC-to-DC converter from Interpoint.

III. Test Procedure

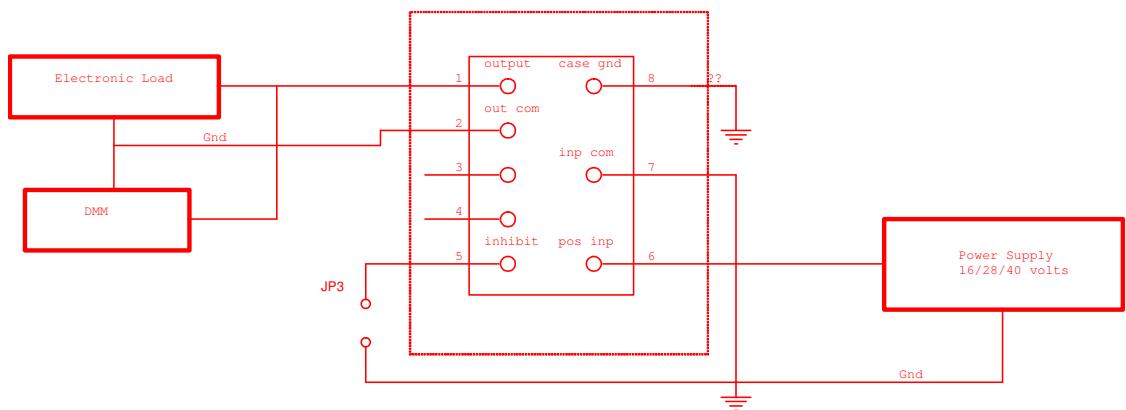
Four converters were tested. Three were exposed at room temperature to gamma rays using the GSFC Co⁶⁰ source per MIL-STD-883, Test Method 1019.7. One device was used as a control. Fig. 3 shows the setup used during irradiation – it is the same setup used for testing after the exposure. Table II shows the bias conditions used during irradiation. The dose levels were 2, 5, 7, 10, 15, 30, and 50 krad (Si) and exposure was at a dose rate of 20 mrad (Si)/s. At each dose level, the parameters shown in Table III were

measured, as was the functionality of all of the devices, including the control part. The parts were annealed at room temperature for one week and then re-measured.

Table II
SMSA2815S Bias Conditions During Irradiation

Parameter		Units
Input Voltage	31	V
Output Current	300	mA
Output capacitor (if any)	220	μF

Fig. 3 shows the setup used for measuring the parametric values. The output voltages were measured with an HP34401 Digital Multi-meter. The output load was varied using an electronic load (HP6060A) and power was supplied to the input from the HP6626A four-channel power supply. Output current readings were provided by the electronic load and input current readings were provided by the power supply.



SMSA2815 Test Setup

Fig. 3. Test setup used for measuring the parametric values of the SMSA2815.

Table III.
SMSA2815S Parametric Values
(Room temperature, unless otherwise specified.)

Parameter	Condition	MIN	MAX	Units
Output Voltage		14.85	15.15	V
Output Current	$V_{IN} = 16$ to 40 V_{DC}		333	mA
Line Regulation	$V_{IN} = 16$ to 40 V_{DC}		50	mV
Load Regulation	No load to full load		50	mV
Input Current	No load		60	mA
	Inhibited		5	mA

IV. Test Results

Results of the parametric measurements are shown in the following tables.

Table IV
Output Voltage (V) as a function of TID.

TID	Control	DUT#1	DUT#2	DUT#3	Average
0	14.930	14.951	14.913	14.927	14.93033
2	14.975	14.961	14.914	14.926	14.93367
5	14.978	14.974	14.910	14.934	14.93933
7	14.977	14.973	14.922	14.935	14.94333
10	14.978	14.972	14.930	14.940	14.94733
15	14.978	14.920	14.936	14.950	14.93533
30	14.978	14.985	14.952	14.981	14.97267
50	14.978	14.955	14.945	14.978	14.95933
Anneal	14.930	14.951	14.913	14.961	14.94167

Table V
Output Current (A) as a function of TID

TID	Control	DUT#1	DUT#2	DUT#3	Average
0	0.32	0.32	0.32	0.32	0.32
2	0.32	0.32	0.32	0.32	0.32
5	0.32	0.32	0.32	0.32	0.32
7	0.32	0.32	0.32	0.32	0.32
10	0.32	0.32	0.32	0.32	0.32
15	0.32	0.32	0.32	0.32	0.32
30	0.32	0.32	0.32	0.32	0.32
50	0.32	0.32	0.32	0.32	0.32
Anneal	0.32	0.32	0.32	0.32	0.32

Table VI
Line Regulation (V) (16V to 40V DC)

TID	Control	DUT#1	DUT#2	DUT#3	Average
0	0.001	0.002	0.001	0.001	0.001
2	0.001	0.001	0.001	0.002	0.001
5	0.001	0.002	0.001	0.001	0.001
7	0.001	0.001	0.001	0.001	0.001
10	0.001	0.001	0.001	0.001	0.001
15	0.001	0.001	0.001	0.001	0.001
30	0.001	0.001	0.001	0.001	0.001
50	0.001	0.001	0.001	0.001	0.001
Anneal	0.001	0.001	0.001	0.001	0.001

Table VII
Load Regulation (V) (No load to full load)

TID	Control	DUT#1	DUT#2	DUT#3	Average
0	0.016	0.017	0.014	0.016	0.016
2	0.015	0.017	0.014	0.014	0.015
5	0.015	0.015	0.013	0.017	0.015
7	0.016	0.016	0.014	0.017	0.016
10	0.017	0.015	0.013	0.016	0.015
15	0.016	0.018	0.013	0.017	0.016
30	0.016	0.017	0.013	0.018	0.016
50	0.016	0.018	0.016	0.019	0.018
Anneal	0.016	0.018	0.016	0.019	0.018

Table VIII
Input Current (A) – Device off

TID	Control	DUT#1	DUT#2	DUT#3	Average
0	0.0330	0.0330	0.0310	0.0310	0.0317
2	0.0330	0.0330	0.0310	0.0317	0.0319
5	0.0330	0.0330	0.0318	0.0320	0.0323
7	0.0331	0.0330	0.0318	0.0319	0.0322
10	0.0330	0.0330	0.0309	0.0310	0.0316
15	0.0330	0.0329	0.0312	0.0314	0.0318
30	0.0331	0.0329	0.0311	0.0304	0.0315
50	0.0330	0.0330	0.0312	0.0380	0.0341
Anneal	0.0330	0.0330	0.0312	0.0380	0.0341

Table IX
Input Current (A) – Device on

TID	Control	DUT#1	DUT#2	DUT#3	Average
0	0.003	0.003	0.003	0.003	0.0030
2	0.003	0.003	0.0029	0.0029	0.0029
5	0.0029	0.0028	0.0027	0.0028	0.0028
7	0.0029	0.0028	0.0027	0.0027	0.0027
10	0.0029	0.0027	0.0027	0.0025	0.0026
15	0.0029	0.0028	0.0027	0.0027	0.0027
30	0.0028	0.0027	0.0027	0.0027	0.0027
50	0.0031	0.0029	0.0029	0.0028	0.0029
Anneal	0.0031	0.0029	0.0029	0.0028	0.0029

V. Conclusions

The parametric values of all parts remained within specifications up to a TID of 50 krad(Si) following exposure to gamma rays at a dose rate of 20 mrad(Si)/s.